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At the Crossroads of Textile Cultures: Textile Production and Use at the South Italian Archaic Site of Ripacandida

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Abstract

Textiles are seldom included within socioeconomic interpretative frameworks of the ancient northern Mediterranean region, although several recent studies have begun to address this lacuna. The Archaic/Classical site of Ripacandida (Basilicata), located in the southern Apennines, has yielded both textiles and textile tools, providing an unprecedented opportunity to examine textile production and use at an indigenous south Italian site. This study presents the results of the complementary analyses of mineralised textile remains and textile tools (spindle whorls and loom weights) found in the cemetery of Ripacandida. The unusual combination of the Greek textile weave (weft-faced tabby) and a characteristic Italic tablet-woven border in two fragments attests to a mixed textile culture. The (to date) unique situation at Ripacandida enables us to reflect on the role of textiles in cultural contact contexts: the way in which textile cultures and their elements met and were mixed or kept separate in south Italy and beyond; the extent to which textile production was socially and economically embedded in a small indigenous community of south Italy; and the role of textiles and textile production as an expression of indigenous–Greek interaction.

Keywords: Archaic southern Italy, Italic–Greek interaction, loom weight, Ripacandida, spindle whorl, textile

Introduction

Textiles represent a category of material little known to the general archaeological audience. The perishable nature of textile remains in the archaeological record has undoubtedly contributed to the silence of textile technology as a major cultural, economic and social component of the Mediterranean past. Textiles, however, are more common in archaeological contexts than generally thought, and recent research has thrown new light on the textile cultures of Italy and their relations to central

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Europe, Greece and the Near East during the first millennium BC (Gleba 2017b). In this paper, we demonstrate the type of information that can be inferred from a detailed analysis of ancient textile remains and of the tools used in their manufacture, and the significance such an analysis has in providing insight into cultural encounters and the resulting mixed expressions that (may) occur.

South Italy was an arena for complex interactions between the indigenous and Greek cultures during the greater part of the first millennium BC (see e.g. Donnellan *et al*. 2016). The complexity and local variability of economic and cultural contacts between the diverse communities led to various degrees of interaction. Over the last two decades, scholars have moved away from a model of Hellenisation, mediated largely by the Graeco-Roman written sources, towards postcolonial concepts of cultural interactions such as hybridisation (van Dommelen 2005; 2011; for current debate on hybridisation, see e.g. Liebmann 2013; Silliman 2015). In material culture, a mix of styles or techniques and influences has been observed most notably in pottery, architecture, settlement and cemetery patterns.

Textiles present a special case in the production system of ancient south Italy. For millennia, most households produced cloth on a small scale for their own consumption. The social changes brought about during the early first millennium BC heralded the development of luxury and surplus textile production on a larger and/or more specialised scale (Gleba 2008: 189-94; Quercia and Foxhall 2014: 69). The foundation of Greek colonies led to the arrival of new techniques and even a new textile culture (Meo 2015: 41-54; Gleba 2017b). Given the importance of textiles in creating individual and group identities through direct interaction with a human body, and at the same time acknowledging the conservative nature of the textile craft, how did these new techniques affect the local *status quo*?

At Ripacandida, a site recently studied with special attention to the social development of the community (Heitz 2016; 2018), the textile remains and tools were recovered from the well-documented burial contexts of a small indigenous community. They are directly associated with individuals who faced a situation of intercultural contact, as witnessed by their equipment, which included Greek or Greek-inspired objects, such as pottery. The site provides an unprecedented opportunity to reflect on the role of textiles and textile production in cultural contact contexts as an expression of a 'materiality of interaction' (Donnellan 2016: 12; see also van Dommelen and Knapp 2010) that resulted from the mixing of indigenous and Greek textile cultures.

In this paper, we present the archaeological context and results of the detailed technical analyses of textiles and textile tools from Ripacandida, which are then considered within the broader gamut of south Italian evidence and Mediterranean textile cultures. Finally, we interpret textile production and consumption at Ripacandida in light of Greek–indigenous interaction in south Italy.

The Site of Ripacandida

Ripacandida is situated in the Melfese, a mountainous hinterland area in south Italy, present-day Basilicata (Figure 1). It occupies a central spot that oversees the junction of the small river valleys of the Calcinara and other tributaries to the Ofanto (Carollo and Osanna 2009: 394). These river valleys, together with the source of the Sele River, formed a trans-Apennine axis between the Tyrrhenian and the Adriatic Seas, whilst the valleys of the Bradano and Basento rivers connected the inland areas to the Ionian coast, suggesting the area may have served as a crossroads (Bottini 1982: 152; Bianco 1999: 142).

An indigenous Italic community used the burial ground from the end of the seventh to the end of the fifth century BC. The excavated

Figure 1. Map of south Italy with sites mentioned in text indicated (image: F. Meo).

parts of the cemetery, uncovered in the late 1970s and 1980s, consist of 134 tombs located on the fringes of the modern town (Bottini 1978; 1979; 1980). The analysis of the cemetery was recently completed by one of the present authors (Heitz 2015; 2016; 2018). Regrettably, settlement evidence contemporaneous with the cemetery is lacking. Limited archaeological finds indicate the presence of wells before (eighth to seventh century BC) and some settlement traces after (fourth century BC) the use of the area as a cemetery (Carollo and Osanna 2009: 394-409).

The construction of the graves is, in most cases, very simple and consists of roughly rectangular pits containing inhumations (Figure 2). Marked differences concern mostly their depth and are probably connected to the age of the deceased, the graves of adults being generally deeper than those of children. In some of the graves, the floor is paved with stones (Figure 3) and in a few cases the construction of a 'sarcophagus' of stone slabs or the alignment of the tomb walls with stones was observed, while in several tombs, the excavators found traces of wooden coffins.

The dead were placed in a crouched position with stretched spine and the legs strongly bent, a position that is very common for indigenous Archaic inhumations in the eastern part of the south Italian peninsula (Scalici 2009; Heitz 2018). Unfortunately, the skeletal material was subsequently lost and is therefore not available for anthropological study, making gender assignment of specific individuals impossible.

Figure 2. Ripacandida Tomb 72, a simple pit with inhumation and ceramic grave goods (image: Soprintendenza per i Beni Archeologici della Basilicata).

Figure 3. Ripacandida Tomb 34, a *fossa* inhumation paved with stone slabs (image: Soprintendenza per i Beni Archeologici della Basilicata).

Burials and Their Grave Goods

The graves are organised in clusters, probably corresponding to families or households (Figure 4). Almost every cluster includes adults and children. The grave goods attest to the wide networks of this small community: apart from locally made pottery, there are vessels that were clearly procured from indigenous workshops farther east (Daunia), southeast (Apulia) and southwest (Campania), but also pottery of Greek type produced either in the colonies or in their vicinity, or imported from the Greek mainland (Setari 1999; Heitz 2018). Pottery and fibulae form part of nearly all assemblages. Weapons seem to be regularly associated with corpses deposited on their right side, whereas textile tools such as

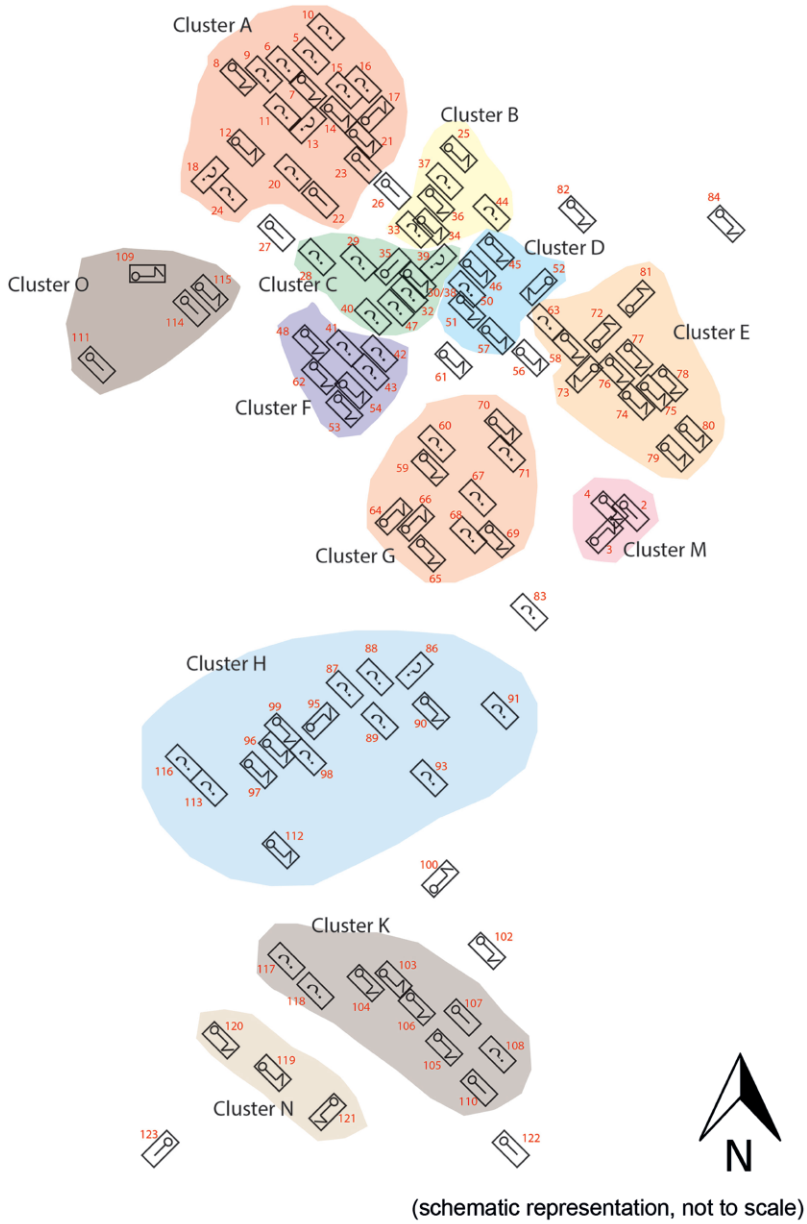

Figure 4. Ripacandida grave clusters (image: C. Heitz).

loom weights and spindle whorls are restricted to individuals placed on their left side. Without skeletal remains it is impossible to determine what this binarisation means, especially since particularly richly equipped individuals with loom weights were also placed on their right side and thus transgress the usual pattern. It should be noted, however, that in osteologically determined burials in other south Italian indigenous communities, weapons are strongly associated with males and textile tools with females and are only rarely deposited together (Vida Navarro 1992: 76-77; Gleba 2008: 173; Quercia and Foxhall 2014: 66-67).

Textile traces were found in eight burials in association with bronze and iron personal ornaments such as fibulae and brooches and, in one case, a spearhead. The largest number of textile remains at Ripacandida was associated with richly equipped Tomb 38 (phase 1, cluster C), dated to the very late seventh or early sixth century BC (Setari 1999; Heitz 2018). It was one of the earliest interments in the cemetery, all of which became the nuclei of the later tomb clusters (Heitz 2015; 2018). The pottery in Tomb 38, primarily of local production, represents a small but full set of the ceramic shapes that form the core of indigenous grave goods across the cemetery: a large *olla* (storage vessel), an *attingitoio* (small ladling vessel) and a jug. This set is accompanied by a drinking cup in the same coarse (local) ware as the *olla* and the *attingitoio*, whereas the jug is part of a contemporary ceramic tradition developed farther west, the so-called Ruvo-Satriano class (Yntema 1990; Herring 1998; Russo and Di Giuseppe 2008). The personal adornment set is quite elaborate: numerous iron and bronze fibulae, among them amber-clad bow fibulae as well as bronze spectacle brooches. The fibulae on which the textile remains were preserved were most probably located in the area of the right hip. Further goods included a bronze ring, a pyramidal amber pendant and silver spirals known as *fermatrecce* ('braid-holders', i.e. hair ornaments). This rich assemblage might be taken as a sign that the deceased was a prominent member of the local community.

Very similar was the assemblage of Tomb 54 (phase 2, cluster F). This included a pottery set of local and Ofanto-Subgeometric production (Yntema 1990), numerous fibulae and silver *fermatrecce*. The iron fibula preserving the textile remains was located on the chest of the corpse.

Tomb 20 (phase 2, cluster A) was rather poorly preserved. The ceramic goods are to be identified as pieces of Ruvo-Satriano ware. The interment was accompanied by several iron and bronze fibulae, among which a single spectacle brooch preserved fabric remains, as well as a spearhead and a large, curved knife.

Tombs 45bis and 45 (phase 2, cluster D) shared the same burial pit. The remains of 45bis are situated directly below Tomb 45 and represent the jewellery deposited with an earlier interment reburied in a small pit below the later corpse. This practice is attested elsewhere in the area (Giorgi *et al.* 1988: 42; Laimer and Larcher 2006: 40). The individual in Tomb 45 was equipped with a spearhead. Apart from at least three bronze fibulae, remains of iron fibulae were recovered. One of them, a fibula with double-arched bow, preserves textile remains.

Tomb 112 (phase 2, cluster H) contained an individual placed on its left side. Traces of textiles were found on one of the bronze spectacle brooches located on the chest, together with at least two other fibulae. The corpse was accompanied by a basic and mixed pottery set.

While the aforementioned graves were of sixth century BC date, other burials belong to the fifth century BC. Tomb 21 (phase 3, cluster A) contained an individual buried on the left side. It was accompanied by a couple of fibulae, located in the chest area, one of which preserved textile traces. The many pieces of the large ceramic assemblage were now produced and decorated according to the new style that appears to have been used both in colonial and indigenous workshops of south Italy, the so-called banded ware.

Tomb 53 (phase 3, cluster F) contained the remains of an individual placed on its right side. The relatively rich assemblage of ceramic goods is dominated by banded ware and Greek or Greek-inspired pottery. However, traditional shapes like the *olla*, jugs and *attingitoi* are also present, although now decorated in the banded-ware manner. Greek shapes (often as banded-ware examples) are present, including the *krater* (mixing vessel), *amphora* and *oinochoe* (wine jug). Vessels directly imported from the Greek mainland cannot be identified securely. The corpse was also accompanied by iron objects: at least one simple fibula, a long straight knife and two spears. Only the socket of one of the latter survived; it preserves abundant textile remains.

The range of objects clearly identifiable as textile tools in the graves of Ripacandida is limited and their total number is low: only four complete spindle whorls and eight loom weights (four of which are complete) were recovered. Judging from the size of the bodies as documented by the excavation photographs, the spindle whorls occur in the graves of a sub-adult (Tomb 121) as well as of adult individuals (Tombs 9, 107). They are associated with both comparatively rich (Tomb 9) as well as rather poorly equipped interments (Tombs 71, 109, 121) spread across different grave clusters. Loom weights seem to have been restricted to adult individuals, occurring in both rich and poorly equipped tombs. The rich assemblage of Tomb 36 included three loom weights, while the rest of the tools were placed in the interments associated with modest grave goods, but all of presumably adult age (*contra* the findings of Osteria dell'Osa: Bietti Sestieri 1992; Robb 1997: 51).

Apart from these clearly identifiable objects, other items probably connected with textile production have been found: a relatively certain example is the needle in Tomb 36. A knife from the same tomb with a short (9 cm) blade, different from the large ones found in other graves, may also have been used in one of the stages of textile production (Gleba 2008: 158-59). More tentatively associated with textile production activities are two needle-like objects (Tomb 46, one of iron, one of bronze) that may have been used as fittings for the base ends of distaffs (Heitz 2016: fig. 15; see type B5 in Gleba 2011: 27-30 and similar gold fittings from the sanctuary at San Chirico Nuovo, località Pila, in Russo 2006: 139-41, fig. 138). It is worth noting that all of these items are rooted in the indigenous tradition.

Textiles at Ripacandida: Structural Analysis

Like the vast majority of protohistoric archaeological textiles recovered in Italy (Gleba 2008; 2017a; 2017b), the fragments excavated at Ripacandida survive due to mineralisation from being in contact with metal grave goods (Figure 5). Mineralised textiles are formations in which metal corrosion products form casts of or around fibres, retaining their external morphology and size almost unaltered either as positive or negative casts (Chen *et al.* 1998). Even when minute, they can provide a considerable amount of information about ancient textiles, including technical parameters such as thread twist and diameter, weave and thread count per cm (indicative of textile quality). Using more advanced methods such as scanning electron microscopy it is even possible to identify the nature of fibre. If a number of textile traces are present in a burial, their type, distribution and position, and the direction of the weave in each fragment, when recorded, can help to reconstruct the function of the textile (whether used as garment, wrapping, etc.).

At Ripacandida, remains of 13 different textile weaves were identified on 10 objects or object groups from eight burials (Table 1). Although some of the objects are bronze (e.g. spectacle brooches), in all cases the mineralisation has occurred due to the presence of iron (such as iron pins attached to the bronze brooches). As a consequence, all of the fibre casts are negative. The details of preservation vary and in some cases are obscured by conservation treatment.

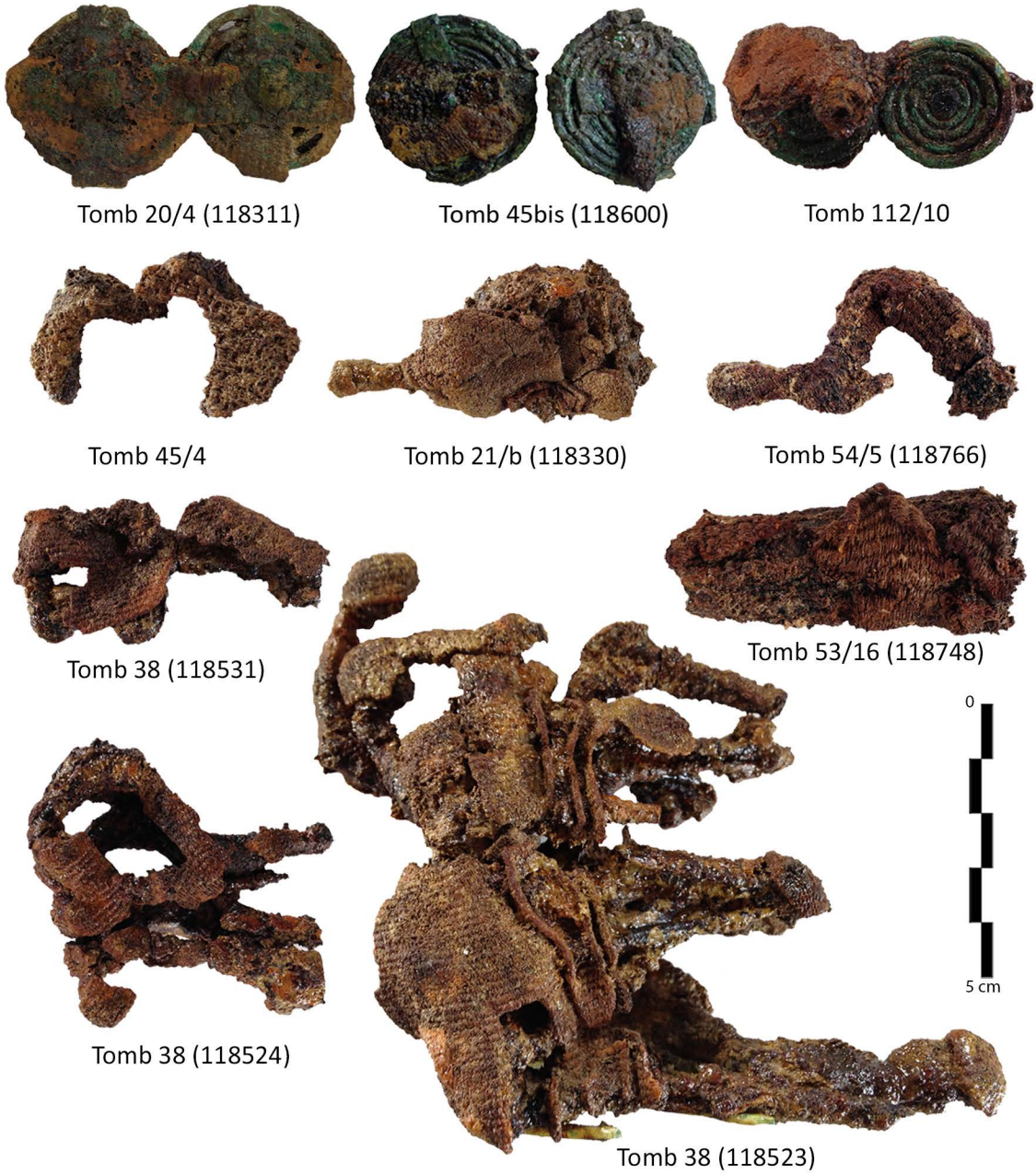

Figure 5. Finds from Ripacandida tombs with mineralised textile traces (images: M. Gleba, F. Meo).

Table 1. Textile finds at Ripacandida: structural parameters.

Burial: Object	*Inv. No.*	*Date BC*	*Position*	*Weave*	*Thread count per cm in warp/weft*	*Thread diameter in warp/weft (mm)*	*Thread twist in warp/weft*
Tomb 38: small iron fibula with double bow	118531 (38/o)	600–550	right hip	weft-faced tabby	10/60	0.5/0.2–0.3	hard z / light z
Tomb 38: block of at least 7 iron and 2 bronze fibulae	118523 (38/h)	600–550	right hip	weft-faced tabby	9/80	0.4–0.5/0.2–0.3	hard z / light z
				tablet weave	20 tablets	0.3/?	hard z / ?
Tomb 38: block of 3 small iron fibulae	118524 (38/b)	600–550	right hip	weft-faced tabby	10/60	0.4–0.5/0.3–0.5	hard z / light z
				tablet weave	20 tablets	0.3/?	hard z / ?
Tomb 45bis: bronze spectacle brooch	118600 (45bis/f)	600–550	?	weft-faced tabby	10/60	0.3–0.4/0.2–0.3	hard z / light z
Tomb 20: bronze spectacle brooch	118311 (20/4)	550–500	?	weft-faced tabby	8-10/40	0.5/0.3–0.4	hard z / light z
Tomb 45: small iron fibula with double bow	118591 (45/4c)	550–500	?	tabby?	4/6	1/1.5–2	z?/z?
Tomb 54: large iron fibula with bone-coated bow	118766 (54/5)	550–500	chest	weft-faced tabby	6/40	0.5/0.3–0.4	hard z / light z-i
Tomb 112: small bronze spectacle brooch	(112/10)	550–500	chest	twill?		0.3–0.4/0.4–0.5	hard z /medium z?
				tabby	20/20	0.4/0.4	z/z
Tomb 21: small iron fibula	118330 (21/b)	500–450	chest	weft-faced tabby	10/40	?/?	?/i
Tomb 53: iron spearhead	118748 (53/16)	500–450	at shoulder	weft-faced tabby	4/40-45	0.9–1.1/0.3–0.5	hard z / light z-i

The vast majority of the weaves at Ripacandida are loom-woven in tabby. A tabby or plain weave is the simplest textile structure attainable with two systems on a loom, with vertical warp and horizontal weft threads alternating one over one in each direction. Balanced tabbies have approximately the same number of threads in warp and weft per unit of length (usually expressed in threads per cm). Weft-faced tabbies have many more weft threads than warp, and they are so tightly packed that the warp becomes invisible, making it difficult to obtain information regarding the warp-thread structure. One of the textiles found at Ripacandida is a fine balanced tabby (Tomb 112/10); another is probably a coarse, slightly unbalanced tabby (Tomb 45/4c); eight others are weft-faced tabbies (Figure 6).

One possible twill may be present on a spectacle brooch (Tomb 112/10), although the preservation is extremely poor (Figure 7). In a twill, the horizontal weft threads pass over and under vertical warps in a regular staggered pattern, each row being stepped to one side of the row above, creating a diagonal effect.

Finally, two object groups, both from Tomb 38, preserve traces of tablet weaving (Figure 8). Tablet weaving involves passing threads through holes in the corners of (usually) square tablets which, when rotated forward or back, act as a

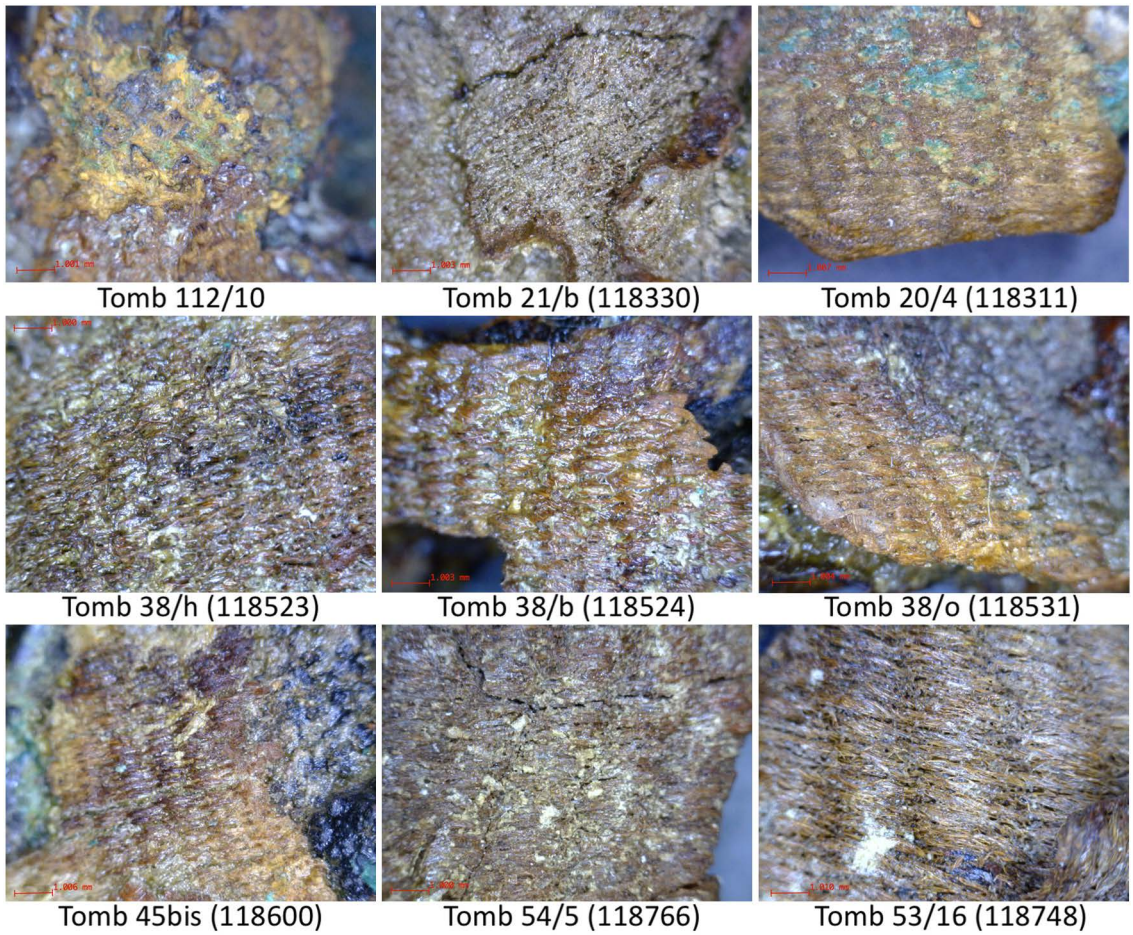

Figure 6. Micrographs of tabby (top left) and weft-faced tabby weaves from Ripacandida (images: M. Gleba).

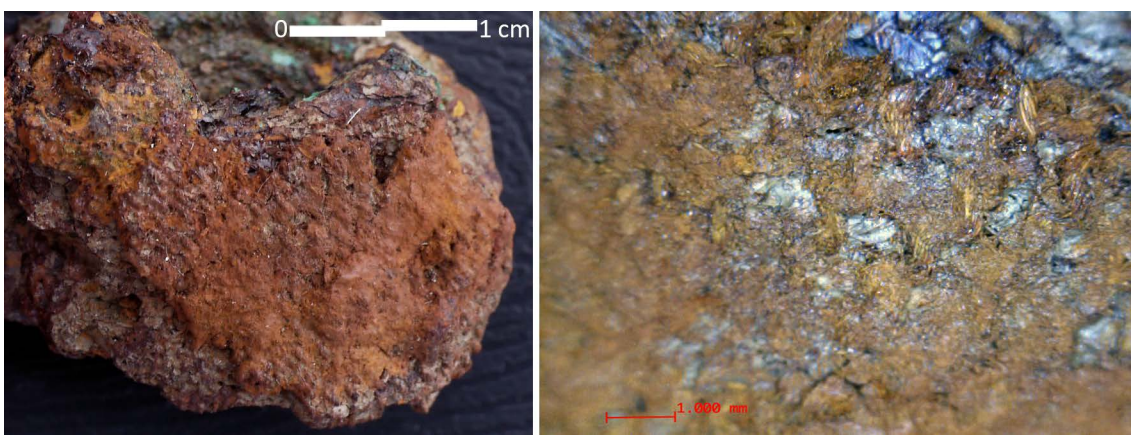

Figure 7. A possible twill on a spectacle brooch from Tomb 112/10 (images: left—H. Landenius Enegren; right—M. Gleba).

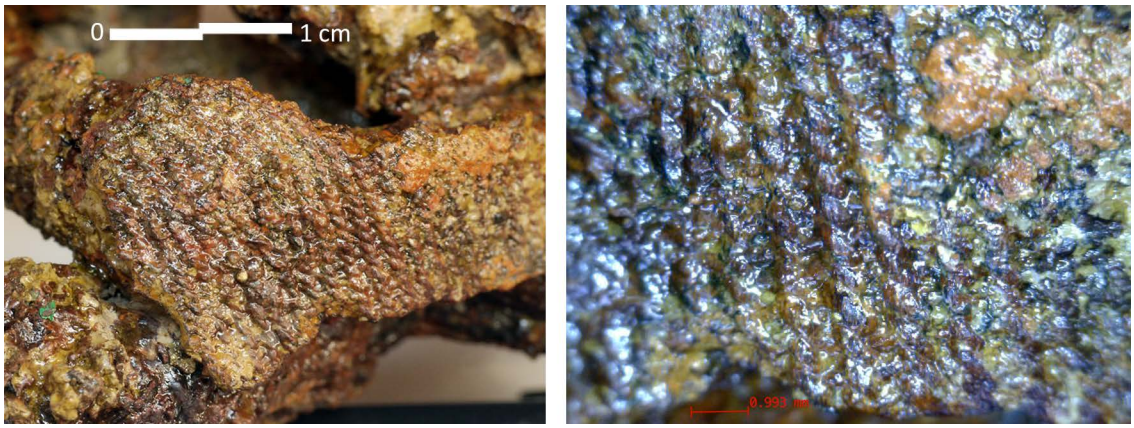

Figure 8. Tablet-woven border on a fibula cluster from Tomb 38/b (118524) (images: left—H. Landenius Enegren; right—M. Gleba).

small loom (Collingwood 1996). By rotating tablets in different combinations, it is possible to achieve patterns. This method is suitable for weaving narrow bands, such as belts, heading bands for the warp of a warp-weighted loom, or decorative borders for the base textile. Such tablet-woven borders are technically complex, extremely labour-intensive, and time consuming. The two tablet weaves at Ripacandida appear to be simple, without variation in tablet rotation direction, but preserved to the width of at least 16 and 24 tablets respectively. While in one case it is not clear if the tablet weave is attached to a ground weave, in the other fragment it appears to be a border attached to a weft-faced tabby. Given their technical similarities and the fact that both come from the same grave and were found in close proximity, they probably belong to the same textile with a tablet-woven border.

All of the textiles at Ripacandida were woven using z-twisted (the conventional way of indicating clockwise spin direction) threads, which is typical for the Italian peninsula during the proto-historic period (Gleba 2017a; 2017b). The weft-faced tabbies, furthermore, have other characteristics in common: they are all woven with hard z-twisted warp and a weft that has a weak z twist, or else they do not have any discernible twist at all (Figure 9). Such a configuration allows the tightly twisted warp to withstand the frequent abrasion of changing sheds during weaving and the less tightly twisted weft threads to be packed more tightly between the warps whilst retaining the softness of the fabric. In contrast, twills and tablet weaves usually have tightly twisted yarn in both systems, which is necessary for the pattern and structural stability of the weave. In weft-faced tabbies, the warp diameter slightly exceeds the weft thickness. The thread count does not exceed 10 in warp whereas it is over 40 in weft, in some cases reaching 60 and even 80 threads per cm. Except in one case where a simple selvedge is preserved (Tomb 53), none of the textiles preserve edges. Based on the analysis of similar finds across Italy and elsewhere (Gleba 2017a; 2017b), weft-faced tabbies, twills and tablet weaves were likely made of sheep wool.

The nature of the textile weaves (weft-faced tabbies, a possible twill and tablet weave—all of which are usually used for garments), their association with a variety of mostly personal metal ornaments, and the position of textile remains in the tombs (where known), suggest that the dead were probably not buried in shrouds (which tend to be in a balanced tabby weave), but dressed (or at least wrapped) in clothes. This is particularly indicated by the differing number and position of the fibulae and brooches, which

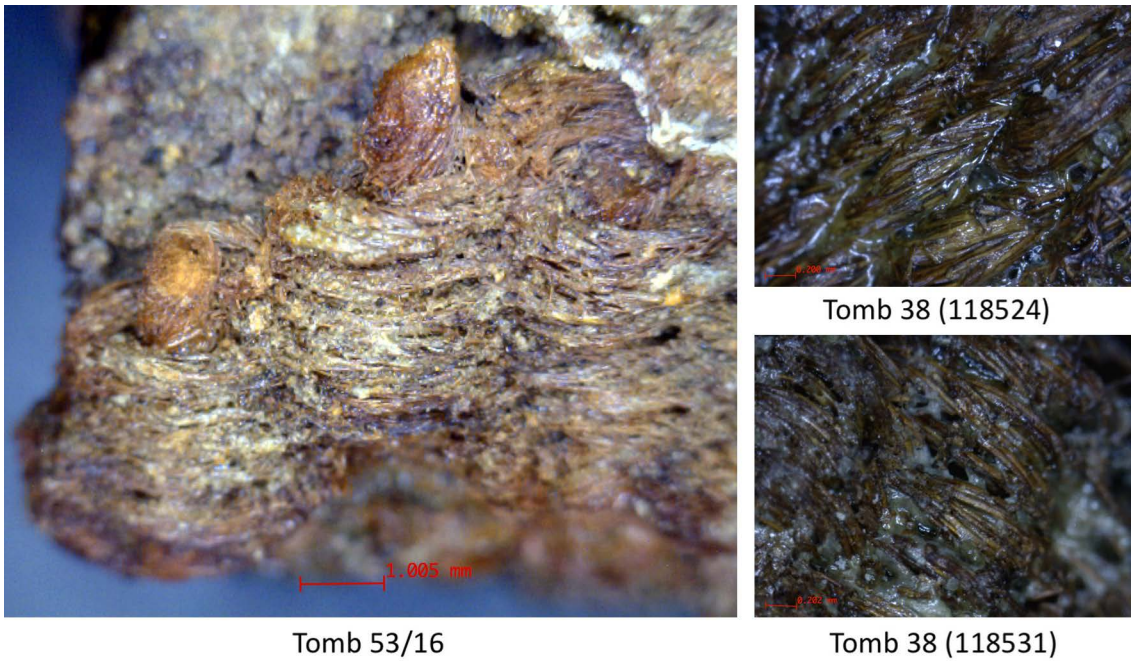

Figure 9. Micrographs of loosely twisted weft threads in weft-faced tabbies from Ripacandida; note two tightly twisted warp threads in the left image visible where the weft broke off (images: M. Gleba).

were attached to the garments and facilitated the preservation of their traces through mineralisation. In Tomb 38, multiple fibulae are preserved together, piercing several layers of the same rather fine textile (Figure 5). In Tomb 112, two different weaves were identified, suggesting two different garments made in balanced tabby and twill respectively, layered one on top of the other.

Textile Tools at Ripacandida: Functional Analysis

The textile tools found at Ripacandida include four spindle whorls and eight loom weights. Despite the limited number of textile tools, a situation not unusual in a funerary context (Gleba 2008: 171, 174), careful analysis sheds light on their productive possibilities in the absence of data from domestic contexts at Ripacandida. The tools were analysed following the method developed at the Centre for Textile Research (CTR) in Copenhagen, which allows estimating textile qualities on the basis of loom weight thickness and weight values based on experimental archaeology, in which reconstructions of textile tools found in archaeological contexts were tested by craftspeople who specialised in textiles (Andersson Strand 2013; 2014; Andersson Strand *et al.* 2015). The experimental testing has demonstrated that textile tool parameters such as the weight and diameter of spindle whorls and the weight and thickness of loom weights correlate with variations in the quality of the textiles themselves, providing insight into thread quality and type of cloth and thus pointing to the type of textiles manufactured at any given archaeological site (Olofsson 2015).

Spindle Whorls

Spindle whorls are small, symmetrical objects of different shapes and materials with a central perforation intended to be inserted onto a spindle—a thin rod made of wood, bone or metal—in order to facilitate the spinning of

Figure 10. Spindle whorls from Ripacandida tombs (image: C. Heitz / M. Laimer).

fibres into thread. The placing of the whorl on the spindle is culturally determined, and thus we speak of high-whorl and low-whorl cultures (Barber 1991: 53). In Italy, as in most of Europe, the low-whorl spindle was in use until the Roman period (Gleba 2008: 100-103). The most important parameters of a spindle whorl—its weight and height/diameter ratio—influence the thread quality produced, which is also dependent on the type of fibre being spun.

Four ceramic spindle whorls were found at Ripacandida (Figure 10): one biconical (Tomb 9/b) and three spherical faceted (tombs 71/div, 107/6, 121/7). Items from 9/b and 71/div do not have exact find spots, but 107/6 was found in proximity of the head and 121/7 in the hip area.

The four spindle whorls from Ripacandida range in weight from 8 to 24 g (Table 2). Light whorls such as the item weighing 8 g would have been suitable for spinning very fine wool. However, experimental testing of spindle whorl replicas weighing 8 g and 19 g using wool fibre demonstrated that the difference in the resulting thread diameter is marginal, both being fine thread qualities (Möller-Wiering 2015: 104). The data thus suggest that the whorls at Ripacandida were used for the manufacture of fine-quality thread. The variation may have been in the tightness of the twist, rather than the diameter.

Loom Weights

In a warp-weighted loom, which was the prevalent type in pre-Roman Europe (Barber 1991), the function of loom weights is to keep the sets of warp threads taut, thus facilitating the insertion of the horizontal weft threads. Warp threads of different material, diameter and strength need different tension for optimal weaving to take place. Loom weights of different weight and thickness are suitable for different types of weaves.

There were eight loom weights among the Ripacandida finds (Figure 11). They are of truncated pyramidal (*frustum*) shape, typical for south Italy (Gleba 2008: 131; Quercia and Foxhall 2014: 65; Landenius Enegren 2015: 131-41; Meo 2015: 66-68). None are decorated. The find position in the grave is only recorded in the case of Tomb 66, where the loom weight was

Table 2. Types, weight and diameter of spindle whorls at Ripacandida.

Inv. Number	*Type*	*Weight (g)*	*Diameter (mm)*
9/5	biconical	9	23.7
71/div	spherical (5 facets)	24	31.6
107/6	spherical (5 facets)	15	28.2
121/7	spherical (7 facets)	8	22.1

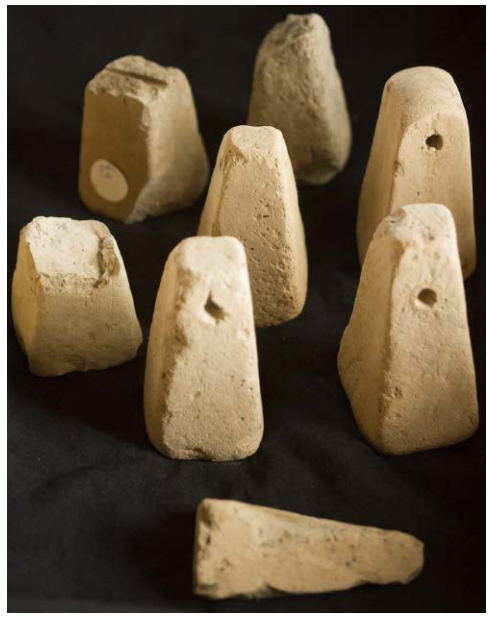

Figure 11. Loom weights from Ripacandida tombs. The thickness of the loom weights ranges between 43 mm and 47 mm (image: H. Landenius Enegren).

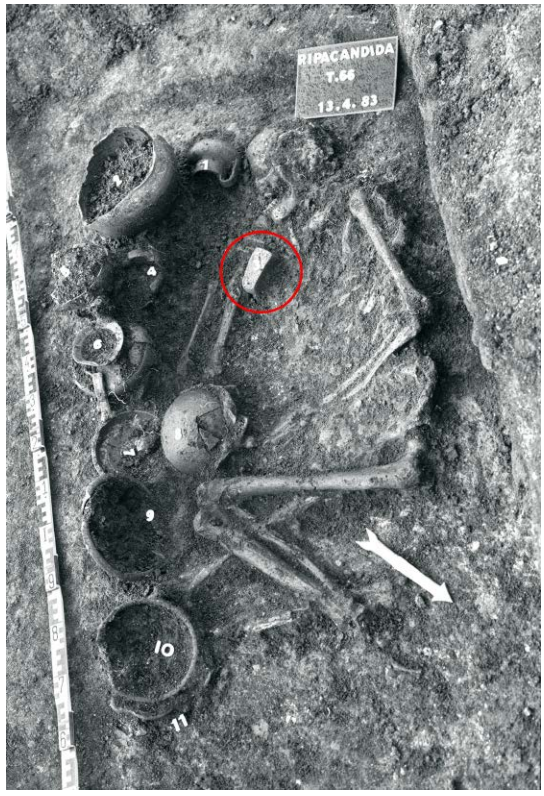

Figure 12. Ripacandida Tomb 66 with the location of the loom weight *in situ* circled (image: Soprintendenza per i Beni Archeologici della Basilicata / C. Heitz).

placed directly on the chest, almost as if worn around the neck (Figure 12).

The estimated weights of the four fragmentary loom weights correlate with those of the four complete objects, ranging between 166 and 213 g. Although this is a small sample, the results of the calculations of potential loom set-ups, based on the CTR method (Andersson Strand *et al*. 2010), demonstrate that the loom weights at Ripacandida were well suited to a weave in which the warp threads would require a tension of 10–20 g. A sample calculation of one of the loom weights (RC04 118928.66/3) is provided in Table 3. The relatively low warp thread count of 3–4 and 7–8 threads per cm would indicate either a very open balanced tabby, or a weft-faced fabric.

Textile Cultures of South Italy

Comparing the results of the analyses of the textiles and textile tools at Ripacandida allows us to make several important observations regarding the production and consumption of cloth at the site, despite the absence of settlement data. First, the notion that the textiles produced with the loom weights recovered at the site were likely to be weft-faced is mirrored by the predominance of weft-faced tabbies in the textile assemblage. Moreover, the warp thread count per cm of the mineralised weft-faced tabbies (4–10 threads per cm) correlates with those in the potential loom set-ups (7–9 threads per cm with a 10 g tension as optimal, but with a wider range of 3–18 threads per cm being possible at thread tensions between 5 and 20 g, thus fully concordant with the textile qualities represented at Ripacandida). This suggests that these implements may have been used in the manufacture of the cloth and subsequently placed with their owners in the graves.

Thanks to the recent studies of tools at other Archaic sites of south Italy, we are in a position to contextualise the Ripacandida results in a wider geographical and cultural area. Analysis of tools from two indigenous Messapic Archaic settlements in Puglia—Cavallino and San Vito dei Normanni—indicates production of textiles very similar to those of Ripacandida (Landenius Enegren 2015: 133-36). The loom weights at Cavallino would have been optimal for producing fabrics using threads requiring a tension of 10–20 g and with a warp thread count range of 4–12 threads per cm. The loom weights at San Vito dei Normanni give a similar outcome: 10–20 g thread tension and 5–10 warp threads per cm. At the Lucanian indigenous site of Torre di Satriano in Basilicata, the first, apsidal building from the end of the seventh century BC until 570–560 BC preserved loom weights of two types. These are optimal for a setup using threads with a tension of 30–70 g per thread

Table 3. Calculations of the number of warp threads using a set of Ripacandida loom weight nr. RC04 118928 based on the CwTR method.

Loom weight nr.RC04 118928 (66/3): weight 181g, thickness 47mm				
	A	*B*	*C*	*D*
Warp threads requiring	5 g warp tension	10 g warp tension	20 g warp tension	30 g warp tension
Number of warp threads per LW	36	18	9	6
Number of warp threads per 2 LWs (one in front and one in back)	72	36	18	12
Warp threads per cm	15	7–8	3–4	2–3
Evaluation of suitability	Possible	Choice	Choice	Unlikely

in the case of the heavier examples, resulting in a very open tabby fabric, since the number of threads per cm varies from 3 to 6; or a setup using tension of 5–10 g for the lighter specimens, resulting in 6–13 warp threads per cm (Quercia 2017: 251). In contrast, almost 400 loom weights associated with the second, late sixth- to early fifth-century BC building were calculated to require 5–7.5 g tension, resulting in a range of warp count between 9–10 and 13–15 threads per cm, if a twill weave were hypothesised, or between 5 and 7 threads per cm in a tabby (Quercia 2017: 256).

Similar results are seen in the Archaic Greek settlements of south Italy. Three sets of loom weights have been discovered in an Archaic house at Kaulonia, and all of them would have been optimal for producing fabrics using threads requiring 5–7.5 g tension, resulting in warp thread count of 4–11 threads per cm (Luberto and Meo 2017). Loom weights at Herakleia, found together with Archaic material and coming both from Taranto and Herakleia, weighed between 50 and 100 g and would have been optimal for fabrics using threads with 5–7.5 g tension, resulting in the warp density of 6–9 threads per cm (Meo 2015: 66-68; 2018).

Although research into textile tools of south Italy is only beginning, these first results suggest that, during the Archaic period, the threads of the Greek *poleis* needed a slightly lower tension than those of the indigenous settlements. Yet both the indigenous and Greek settlements of south Italy produced fabrics that had a relatively low warp density, usually not exceeding 10–12 threads per cm, and were likely weft-faced. So how does production of weft-faced tabbies in south Italy fit within a wider picture?

The earliest weft-faced tabby identified to date in Italy comes from the eighth-century BC Fondo Artiaco Tomb 104 at Cumae, one of the earliest Greek foundations in Italy, and has numerous technical characteristics indicating that it is an import (Gleba and Vanden Berghe n.d.). Otherwise, weft-faced tabbies are generally not known in Italy before the seventh century BC (Gleba 2017a; 2017b). Numerous examples have been found at Alfedena in the Abruzzo region, an area that was culturally associated with the Adriatic basin during the Iron Age (Nijboer 2011); in a few exceptionally rich Etruscan and Latial burials, which also contained an extraordinary quantity of eastern Mediterranean imports, e.g. at Grotte di Castro (Gleba and Laurito 2015: 338); and in south Italy, dating to after the foundation of Greek settlements. In the Bay of Naples area, weft-faced tabbies have been observed among Archaic-period finds from Cumae (Gleba *et al.* 2017). In Basilicata, they have been found at Chiaromonte, specifically Tomb 325. Finally, closest to the cultural sphere of Ripacandida, a weft-faced tabby is present on a fibula from Archaic Ascoli Satriano (Tomb 11/13; the authors have seen a photograph kindly provided by Dr Astrid Larcher).

All other pre-seventh-century BC textile finds in south Italy (so far not very numerous) are twills. These include the still unanalysed finds from Torre Galli in Calabria (Pacciarelli 1999: pl. 189.E-I), dated to the tenth to ninth centuries BC; a 2/2 chevron twill of exceptional quality dated to the eighth century BC, found at Incoronata San Teodoro in Basilicata (Gleba 2017b); and a 2/2 twill from Tomb 53 at San Marzano sul Sarno in Campania, dated to the end of the ninth century BC (Gleba 2008: 57, 59, fig. 46). In fact, recent analysis of numerous mineralised textile fragments preserved in burials demonstrates that, during the Iron Age, indigenous Italic populations from Veneto to Basilicata were producing wool textiles woven in twill weave (Gleba 2017a; 2017b). These twills are often spin- or shadow-patterned, i.e. made using alternating groups of threads spun in opposite directions, which would have created a subtle damask-like pattern of checks or stripes. The textiles are usually balanced, having a similar number of threads in warp and weft, which are around 20–30 threads per cm. Last but not least, these twill textiles often have tablet-woven

borders. Close connections in terms of textile technology can be found with the Eastern Hallstatt Culture (Grömer *et al.* 2013), indicating that Italy was part of a wider central European textile culture (Gleba 2017b).

In contrast, the vast majority of Greek Iron Age and Archaic textiles are tabbies or weft-faced tabbies (Spantidaki and Moulhérat 2012; Spantidaki 2016; Gleba 2017b). There is no evidence of spin- or shadow-patterning, and the weft threads usually have only weak twist or no discernible twist at all. There is also no direct evidence to date of the use of tablet-woven borders in any of the Greek textiles. Nor do the archaeological textile remains thus far found on Cyprus have such borders; rather, they show balanced tabbies (Landenius Enegren and Vanden Berghe 2016). The Late Bronze Age sites of Enkomi and Kition produced 'fine fabrics that were weft-faced' (Sauvage and Smith 2016: 203). Greek textile culture is much closer to the traditions of the Near East, where balanced tabbies and weft-faced tabbies have also been discovered with, as yet, no direct evidence of twills or tablet weaves (Gleba 2017b). This tabby-based textile culture appears to have spread westwards by the seventh century BC as part of direct or indirect contact with the Greeks, and by the end of the first millennium BC it essentially supplanted the indigenous Italian twill tradition.

Greek weft-faced tabbies are, in many cases, finer in terms of thread diameters and thread counts than any of the fabrics of the same type found in Italy, Ripacandida examples included. Weft diameters in Greek weft-faced tabbies are often less than 0.2–0.1 mm and the weft count can reach very high numbers—over 80 and, in some cases, over 110 threads per cm (Gleba 2017b). The only example of this quality found in Italy is a likely import from Cumae (Gleba and Vanden Berghe n.d.). Curiously, calculations based on loom weights carried out at Herakleia and Kaulonia suggest that the threads optimally suited for them would have been ca. 0.1–0.3 mm in diameter, whereas those used at contemporary indigenous sites would have been thicker, ca. 0.3–0.5 mm (Landenius Enegren 2015; Meo 2015; Luberto and Meo 2017). Both textiles and tools thus indicate that, even though the textile technique was the same, Greeks both at home and in their western colonies may have produced finer cloths.

The explanation for this difference may have to do with skill level, but could also be the result of differences in the raw materials available to and used by different populations in Italy and Greece. Wool-fibre diameter studies have suggested that, during the first millennium BC, several distinct wool qualities coexisted within Italy and more broadly across Europe, possibly reflecting the use of several distinct sheep types (Gleba 2012). In the meantime, a recent archaeozoological study has demonstrated a distinct and significant change in the size of domestic sheep in southern Italy following Greek colonisation (Gaastra 2014). This change could have resulted either from the translocation of Greek domesticate varieties to the colonies, or from the local development of 'improved' varieties (Gaastra 2014: 495). According to some literary sources, the polis of Sybaris imported Milesian wool to weave fine garments (Timaeus of Tauromenium, F 50 in *FGrH* = Athenaeus 12.519b). If Greeks 'imported' to south Italy sheep varieties particularly suitable for the production of weft-faced tabbies, it might explain the differences in textile quality between weft-faced tabbies produced at indigenous sites and those woven in the Greek *poleis*.

The possibility thus remains that not only techniques and fashions but also sheep providing wool of a quality particularly suitable for the production of fine weft-faced tabbies may have arrived in south Italy along with Greek settlers. As with many other aspects of Greek culture, however, the adoption was not wholesale; rather, some aspects of Greek textile culture were adapted to local needs and desires. In this respect, the discovery at Ripacandida of a unique weft-faced tabby with an integral

tablet-woven border is particularly significant. It combines what we see as a typically 'Greek' weave structure with a typically 'Italic' border and may thus indicate the development of a new, mixed-textile culture which combines two distinct technologies belonging to different traditions.

Borders are well illustrated in Etruscan and Italic representational material (Bonfante 2003; Nieling 2007). Scholars argue that they were not purely decorative but served as indicators of status and rank (Raeder Knudsen 2012; Stauffer 2012). The textiles may have served as indicators of social rank or as 'ceremonial' clothes, with the border functioning as the distinguishing element characterised by technique, pattern and colour. Their importance is emphasised by the fact that the consumers of the textiles found at Ripacandida, whilst adapting the new textile weave from their Greek neighbours, chose to retain the border in the production process.

Textiles and Greek–Indigenous Interaction in South Italy

How, then, can we interpret textile production and consumption at Ripacandida in light of Greek–indigenous interaction in south Italy? From a technical point of view, most of the textiles at Ripacandida are relatively high-quality weft-faced tabbies likely made of sheep's wool. The results of the analyses of the textile tools found in the burial assemblages correlate with the structural analysis of the fabrics, suggesting that, at some point at least, they could have been used to produce fabrics very similar to those found in tombs. Nevertheless, whilst the predominance of weft-faced tabbies at indigenous Ripacandida indicates a clear connection with the Greek textile tradition, the presence of a characteristic Italic tablet-woven border on one of the textiles reflects a mixed textile culture. How did it evolve?

The material culture in the graves of Ripacandida (specifically pottery) testifies not only to the firm-rootedness of the community in the Italic tradition, but also to the wide range of its connections, from the lowlands of northeast Apulia (Daunia), up into modern Campania in the west (Ruvo-Satriano area) and to the Greek settlements in the south/southeast (imports and banded wares). One possible explanation for this wide range of contacts is that the community was partly mobile (for full range of arguments see Heitz 2017). The remarkable local *askoi* (squat pouring vessels) with bull's-head *protomes* and ram-shaped bronze pendants suggest a high significance and prestige attached to livestock ownership and the practice of stockbreeding (Heitz 2015; 2016; 2018). Mobile pastoralism (transhumance) is historically well attested in this area from the second century BC until the middle of the twentieth century AD (e.g. Garnsey 1988; Santillo Frizell 1996; Petrocelli 1999), to such an extent that Braudel (1996 [1939].1: 85-102) classified it as an important element of the *longue durée*.

Ripacandida might have served as a stopover point on the seasonal routes between the upland summer and lowland winter pastures in the Apulian coastal region, mirroring exactly the course of the routes that the so-called *statonica* transhumance took until recently (Sprengel 1971: 135-40). Unlike nomadism, in mobile pastoralism the phases of movement only cover some days or weeks, while the stationary phases last weeks or even months (see e.g. Carrier 1932: 8; Hütteroth 1959: 38; Carrer 2015: 10). Often inextricably connected to sedentary populations, ethnographically documented mobile pastoralist economies are highly dependent on the existence and potential of markets, where a large proportion of raw products like milk/cheese and wool would be sold to sedentary communities engaged in their further processing in exchange for finished products and other goods (e.g. Hütteroth 1959; Barth 1961: 8-9; Ferdinand 1969: 136; Petrocelli 1999; Mientjes 2004; 2010).

Such a practice, ethnographically documented in modern mobile pastoralists, may shed more

light on the indigenous–Greek relationship if we suppose that textile production was indeed a major factor in Greek–indigenous exchange and even co-operation: while the wool was generated by indigenous semi-mobile pastoralists, textile production was largely in the hands of settled Greek (and other indigenous) communities such as Metaponto or Taranto. The latter is well documented as a major textile-producing centre, at least in written sources, since the Archaic period (Meo 2015: 37), and one that exerted strong influence over the surrounding territory, including over the organisation of textile production. Quercia and Foxhall (2014: 69) interpret the standardisation of the later group of loom weights at the indigenous site of Torre di Satriano in shape, size, weight and manufacturing techniques as indicative of the adoption of Greek (Tarantine) weaving traditions.

Indigenous populations may have initially obtained weft-faced tabby textiles from Greek sources, but they soon took up the weaving technique itself. When a new craft technology is adopted, the necessary knowledge and know-how must be acquired from a different community of practice (Lave and Wenger 1991; Wenger 1998; Wendrich 2012). The indigenous weavers could have learnt the weft-face tabby technique during the prolonged stationary (winter) phase of transhumance when the exchange of the raw materials took place, as the transmission of the necessary knowledge and technical skills would have required more or less extended contact between the apprentice and a skilled practitioner, the amount of time depending on the learner's knowledge and skill (Cutler 2012: 148-49).

The presence of weft-faced tabbies at other indigenous sites, such as the nearby Ascoli Satriano and more distant Chiaromonte, suggests that Ripacandida community was not alone in taking up the new technique, although the reasons behind the adoption of the weft-faced tabby by south-Italian indigenous weavers is more difficult to disentangle. Was it the novelty factor, or part and parcel of new fashion? Did it present new technical possibilities (e.g. creation of tapestries with figural decoration)? Was it desirable for its texture, drapability or appearance, or was there perhaps some other perceived appeal? Whatever the reason, the adoption of weft-faced tabby was not universal and some of the indigenous communities of south Italy continued to produce traditionally Italic twills long after the arrival of a new Greek cloth type. The recent discovery of twill textiles, which preserve complex geometric decorative patterns, in the warrior's Tomb 382 at Ordona (ancient Herdonia), dated to ca. 400 BC, demonstrates that at least Daunian elites continued to use twills (Catalli *et al.* 2018).

Even at Ripacandida the new technique was not adopted wholesale: it was combined with a long-standing tradition of adding tablet-woven borders, as exemplified by the finds from Tomb 38. These borders were clearly indispensable identity indicators among the Italic populations that were not susceptible to the influences of new fashions or techniques.

Conclusions

Textile culture based on wool twills and tablet-woven borders was well established in south Italy, as elsewhere on the Apennine Peninsula, by the beginning of the Iron Age. During the Archaic period, in certain situations, contact with the weft-faced tabby-based Greek textile culture gave way to the creation of new expressions. The remains found at Ripacandida provide the first example of how textile traditions and their elements (indigenous vs. Greek) met and were indeed combined in south Italy. A (partially) mobile character of the Ripacandida population (Heitz 2017) may have been the key reason for its quick uptake of the new type of weave, likely initially through exchange of ready-made cloth with the Greek newcomers.

For the time being, the textile culture at Ripacandida is unique and, in our opinion, is the direct consequence of prolonged and intimate

interaction between textile workers from the indigenous communities and settled Archaic Greek communities (however they came into contact with each other), which would have been a *conditio sine qua non* for the technological exchange to happen between them. Yet the use of tablet-woven borders on a weft-faced tabby underscores preoccupation with the local, Italic, audience, for whom their significance as status markers would have been quite clear. Indigenous–Greek interaction resulted in the creation of this unusual mixed-textile culture, which finds comparison in the production of vessels of indigenous shape and Greek-style decoration or *vice versa* (Carpenter *et al*. 2014). We deliberately avoided the use of the term 'hybrid' here, as at this time our evidence is too singular to argue that the Ripacandida textiles are a result of the creation, through interaction and negotiation, of new transcultural forms, ambiguous cultural affiliations and/or meanings (*sensu* van Dommelen 2005: 118). We can only hope that as more textile finds are analysed from other sites in the region, our understanding of local textile cultures and their interaction will obtain the necessary depth. Ripacandida is the first harbinger of this textile revolution.

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Athenaeus, *The Learned Banqueters* (*Deipnosophistae*).

Abbreviation

FGrH:

Jacoby, F.

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